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Concrete Industry Hatches New Ideas

Better Form Materials Lead to Better Finished Surfaces and Elimination of Plaster — High Frequency Vibration—Progress in Concrete Technology—Some New Light-Weight Aggregates—Should Push R. F. C. Projects in 1933

THE low construction volume of 1932 was in no sense a deterrent to progress in the development of improvements in the art of making, transporting and placing concrete.

Probably the most striking development of the year was the progress made in solving the problem of obtaining a smooth, dense finish in monolithic concrete work. This progress was made largely through the increasing use of special form materials, and the employment of high-frequency vibrating tools.

Nearly every issue of CONCRETE published in 1932 carried articles dealing with this phase of concrete work. The special form materials used consisted mainly of standardized metal forms, and specially fabricated products such as wood-fibre board (masonite) and sheets of plywood. In addition to greater smoothness of finish, the use of these standardized form materials has also resulted in direct economy in the cost of form work, while a number of cases have been reported where further economy was made possible through the elimination of plaster in building interiors.

Elimination of Plaster

The elimination of interior plaster work through the use of special form materials was illustrated and described in articles in CONCRETE in the April, May and June issues of 1932, and in this issue. In several of the cases described, concrete masonry units, as well as monolithic concrete, were employed in obtaining an attractive interior finish without the application of plaster.

High-Frequency Vibration

Some five or six manufacturers now have high-frequency vibrating tools on the market. Some vibrators are designed for use in placing monolithic concrete, and others have been developed for use in the manufacture of concrete masonry units, cast stone and concrete pipe. So far as monolithic concrete is concerned, practice is inclined toward the use of internal vibrators wherever possible, rather than tools attached to the form work. Concrete can be vibrated successfully by the latter method when the form work is properly built, so that the vibrations may be transmitted through the forms without spreading them.

It can be said, with much truth, that the increasing use of ready-mixed concrete goes hand in hand with increasing interest in the technology of concrete.

An outstanding contribution to the technology of concrete—the science of controlling quality—is the series of articles by Joseph A. Kitts, started in the May (1932) issue of CONCRETE. In this series the author covers all phases of control, following the practice developed by him in producing ready-mixed concrete.

The ready-mixed concrete industry has recognized the need for a standard purchase specification to govern the use of this material. The development of such a specification was undertaken during the year by the National Ready-Mixed Concrete Association,[1] and the work has also been taken up by a committee of the American Society for Testing Materials.[2]

Conveying Concrete

The need for economy in transporting concrete from the mixer to the place of deposit has resulted in the greater use of devices such as continuous belt conveyors, portable belt conveyor units, special concrete trucks, and related equipment. In addition, a new concrete pump has been introduced in this country from abroad, and some progress has been made in its use. Further development of conveying equipment of this character may be expected.

Light-Weight Aggregate

Further interest in light-weight aggregate has been shown in the fact that the year just closed saw the introduction of at least three new materials of this character for general use in concrete work. One is a burned clay product and the others are produced from slag.

Valuable contributions to this interesting subject may be seen in recent articles in CONCRETE, notably the one published in the issue of September, 1932, under the heading "Light-Weight Aggregates Available Over Wide Area," and a second article appearing in the issue of January, 1933, under the heading of "What Light-Weight Concrete Means in Dollars and Tonnage."

Fireproofing Steel-Framed Buildings

Details of standard practice followed in the fireproofing of steel-framed buildings with concrete appears in a valuable series of articles by J. Arthur Garrod in the February, March and April (1932) issues of CONCRETE. The author presents step by step the methods employed in New York City, where this form of construction has reached its greatest development.

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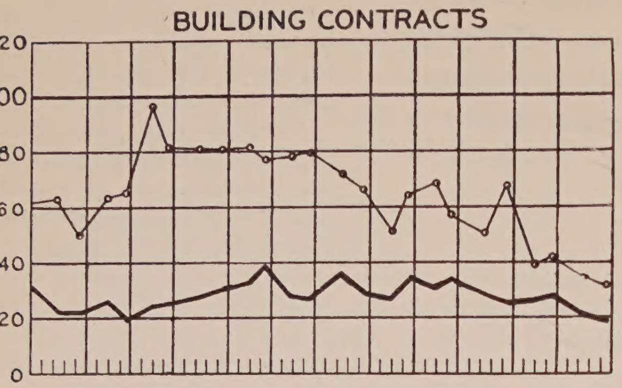
[1] See April (1932) issue of CONCRETE, page 29, and May (1932) issue, page 27.

[2] See June (1932) issue of CONCRETE, page 20.

Cement and Cement Shipment

Users of structural concrete have a direct interest in the fact that an increasing number of cement companies now manufacture high-early-strength cement. It is apparent that designers of concrete structures are becoming better acquainted with the various ways in which advantage may be taken of the property of high early strength. It seems certain that greater use will be made of these special cements from year to year.



Daily average of building construction contracts. Upper line is for 1931, and lower line for 1932

Facilities for the shipment of bulk cement by rail have been developed during 1932, thereby enlarging the opportunity for the use of cement in this form on large construction projects.

R. F. C. Construction Projects

No one can foresee what the construction industry may expect in 1933. Nevertheless, several important probabilities hold out the hope of at least some measure of improvement as compared with 1932. First, there is the matter of self-liquidating construction projects financed by loans from the Reconstruction Finance Corporation. This year of 1933 will be the first year to gain benefit from this source, for by the end of 1932 no self-liquidating R. F. C. construction project had reached the stage of actual construction. The early months of 1933 will see the beginning of some of this work, and the volume should increase as the year proceeds.

Several national organizations, notably the National Committee for Trade Recovery, are giving special attention to the development of R. F. C. projects as a contribution toward business recovery.

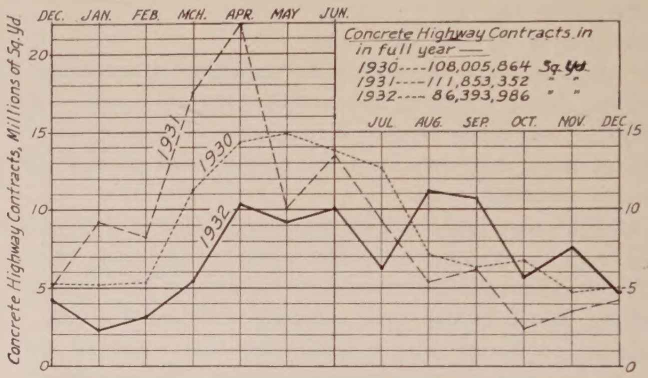
While it may be said that many people have lost faith in charts and curves, the small chart shown in the accompanying illustration does offer encouragement. The upper line, showing the daily average of building construction contracts in 1931, reflects the general continuation of business decline in that year. The lower line, giving similar data for 1932, shows a very slight upward tilt, indicating that in 1932 we reached the minimum in construction volume. In a word, it appears that the bottom has been reached in this branch of the construction industry.

The one outstanding fact about the construction industry is that it behooves every one to get behind the movement to develop self-liquidating R. F. C. projects. On this question there is little room for difference of opinion.

Concrete Highway Awards in 1932 Reach High Figure

The December total of 4,638,047 sq. yd. of concrete road work for which contracts were reported by the Portland Cement Association brings the total for the full year of 1932 to 86,393,986 sq. yd. This is 77.2 per cent of the record figure of 111,853,352 sq. yd. for which contracts were awarded in 1931.

The chart here illustrated shows clearly the beneficial effect of the credit of $120,000,000 made available by the Federal Relief Act, much of which was taken up by the highway departments of various states. In addition, a considerable volume of the contracts awarded in the second half of the year represented deferred work which highway departments had hesitated to place under contract earlier in the year because of the clamor for reduced public expenditures.



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Coming Conventions

February 21-24—American Concrete Institute, twenty-ninth annual convention. Palmer House, Chicago, Ill.

February 23—Concrete Masonry Association, third annual convention. Palmer House, Chicago, Ill.

February 27-28—American Concrete Pipe Association, twenty-sixth annual convention. Royal York Hotel, Toronto, Ontario, Canada.

June 26-30—American Society for Testing Materials, annual meeting. Stevens Hotel, Chicago, Ill.

June 26-July 1—American Society of Civil Engineers, annual convention. Chicago, Ill.

Concrete Masonry Finds New Markets

By W. D. M. ALLAN
Manager, Cement Products Bureau, Portland Cement Association, Chicago, Ill.

Some Notable Sales of Concrete Ashlar in 1932—Low-Cost Fireproof Homes, Slum Clearance, Concrete Ashlar, and Federal Government Work and Relief Construction Should Be Marketed This Year

DURING no single year in the history of the concrete masonry business has there been more real progress made than in 1932. This is no overstatement of fact, nor is it intended to cover up the many difficulties the industry has faced. In making this statement, I have not overlooked the small volume of business available, the ruinous prices that have prevailed in the ordinary run of block, the large number of idle plants and the feeling of pessimism that has gripped many products manufacturers.

In spite of all this, 1932 looms large in the march of progress.

Concrete masonry was successfully used in a larger number of outstanding jobs than during any other like period. Let's refresh our minds. Concrete ashlar for both exterior and interior walls heads the list. While a start was made in 1931, the proved value of the material was not assured until 1932. The list of outstanding jobs would do justice to a boom year.

The Federal North-Eastern penitentiary at Lewisburg, Pa., designed by Alfred Hopkins and Associates, New York City, used more than 700,000 concrete ashlar units for interior walls. Just completed a few weeks ago, this job is widely recognized as a forward step in penitentiary design. The durability and decorative features of concrete ashlar aided in making this job outstanding.

At Wallkill, New York, 300,000 concrete ashlar units, plain and colored, random, patterned and coursed, were used to make this prison for the State of New York, tucked away in the foothills of the Catskills, back of Newburgh, one of the most beautiful public buildings in the state. Concrete ashlar was used for both the exterior and interior walls.

It was a long road from the rock-faced monstrosities of ten years ago to these excellent architectural treatments of 1932.

Radio Station Jobs

And, again, exposed concrete ashlar was used in the construction of radio stations for KSO, at Des Moines, and in the broadcasting rooms of one of the finest radio stations in the country, WCAU, at Philadelphia. No more important progress was ever made than when this material was recognized for its acoustical and fire-resistant properties in the construction of broadcasting rooms.

Between thirty and fifty million visitors to the Century of Progress in Chicago in 1933 will see concrete ashlar in the auditorium and stair-walls of the General Motors Building.

This entire issue of CONCRETE would be required to detail the scores of jobs, including theatres, homes, schools, churches, business and industrial buildings, in which concrete ashlar was used for its decorative, acoustical, fire-resistant and structural properties.

First-rate merchandisers have always recognized that in a buyers' market new products, aggressively sold, have the best chance. This proved particularly true of concrete ashlar in 1932.

Working through the Concrete Masonry Association, the concrete masonry industry published a sales manual, "Facts About Concrete Masonry,"[1] which is the best manual in the building material field. It has proved of great value to architects, engineers and contractors as well as to the five hundred or more concrete masonry salesmen who are every day beating the bushes for work.

The best time to do educational work and develop specifications is during slack periods. Concrete masonry salesmen have been in more architects' offices, carried the message of their material to more builders, and have created more prestige for their products in 1932 than in any other year. Architects and engineers have time to listen to the interesting facts the salesmen tell. This groundwork can best be done when it interferes least with direct sales.

New and Revised Specification Standards

Excellent progress was made in revising the A. S. T. M. tentative specifications for concrete brick. The A. C. I. adopted tentative standard specifications for concrete burial vaults. The Federal Specifications Board adopted specifications for concrete brick. The Department of Commerce revised its specifications covering standard sizes for concrete masonry units. The Division of Commercial Standards of the Department of Commerce, in co-operation with the Cast Stone Institute, adopted standard samples for color and texture, covering the more generally used types of cast stone. Samples have been duplicated and are being made available to government building departments, cast stone manufacturers, and private architects. Cast stone can now be easily specified by code number.

Considerable research was carried on in different parts of the country covering the application of high-pressure steam curing to concrete masonry units. The general recognition of this important phase of concrete products manufacture represents a forward step and lends impetus to an important research.

Concrete products manufacturers in many sections of the United States recognized the growing demand for low-cost, fireproof concrete homes,[2] and did excellent work in developing their materials for this type of construction. They have co-operated with architects and builders to develop the best combination of concrete products for the construction of fireproof concrete homes.

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[1] Reviewed in August (1932) issue of CONCRETE, page 25. See also "Concrete Ashlar Masonry," published by the Portland Cement Association and reviewed in the March (1932) issue of CONCRETE, page 32.

[2] See January (1933) issue of CONCRETE, page 23, describing new book on "Low-Cost Fireproof Concrete Homes," published by the Portland Cement Association.

Precast concrete joists, particularly for residence construction, made real progress. Many manufacturers are studying this problem, acquainting themselves with the patent situation, and developing molds and designs for this type of construction. The joists for ordinary residence construction will vary from 13 to 16 pounds per running foot, so that it is possible for two men to unload and set the joists without the use of special handling equipment. Certain manufacturers believe that the market for concrete joists may be nearly as great as that for concrete masonry and that the profit in concrete joists may be even greater.

The Architects' Small House Service Bureau prepared ten small house plans which were published in twenty to thirty important newspapers, featuring concrete masonry with fireproof floors and roofs. This makes a total of about sixty small house plans which are available to products men and builders from the Architects' Small House Service Bureau, 10 North Clark Street, Chicago, Illinois, at nominal cost.

WHAT ARE THE PROSPECTS FOR 1933?

It is dangerous to predict what the market for concrete products will be in 1933—dangerous for two reasons: First, because nobody knows, and, second, because when predictions are made there is a tendency to sit back and wait for them to come true. There is no place in 1933 for the individual or industry that sits and waits. Nothing ever came from doing nothing.

Collins Out After Business

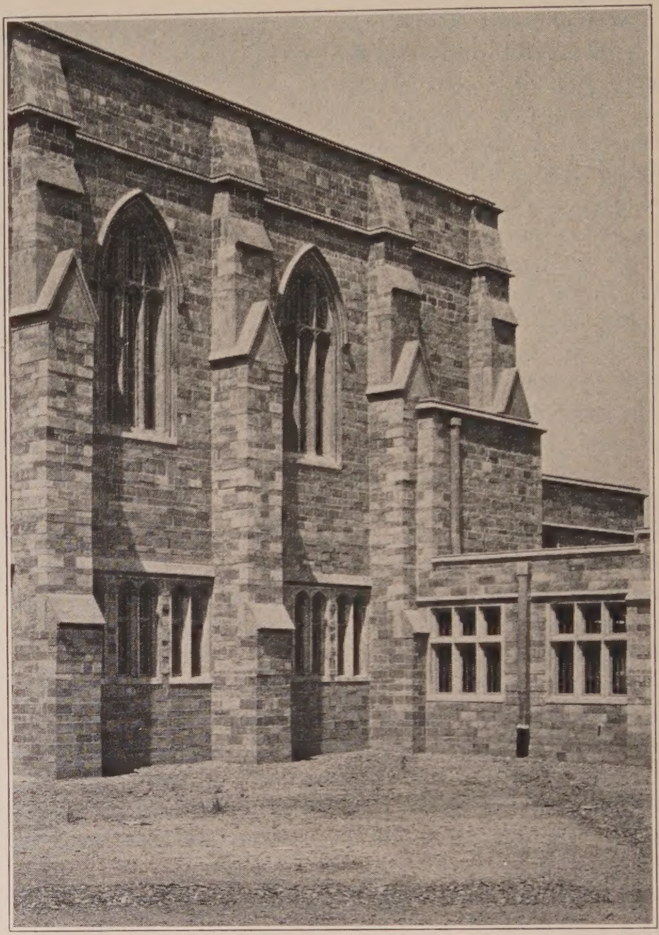
The president of the Concrete Masonry Association, D. R. Collins, is doing everything he can to develop business for concrete masonry manufacturers in connection with the tremendous government building program. More work will originate in Washington in 1933 than in any other sections of the country. Collins is on the job twenty-four hours a day, as long as the funds hold out, trying to get business for concrete products manufacturers who are co-operating with him on government work.

No one unfamiliar with the difficulties involved in getting specifications for concrete masonry realizes the tremendous amount of work required on every job. If the concrete masonry industry will give Collins support in his work in Washington during 1933, they have every reason to be optimistic about the number of jobs that they will be permitted to bid on.

Slum Clearance

The probability is that slum clearance will represent a larger percentage of construction in 1933 than in any previous year. Several state laws have been, or are soon to be, amended to permit the use of funds provided by the Reconstruction Finance Corporation. Wherever these laws are up for consideration, the concrete masonry industry should lend its support. As soon as the laws are passed the manufacturers of concrete masonry should contact the leading financial groups, architects and builders who will be instrumental in developing slum clearance jobs.

Four major building codes are under revision at the present time and will require considerable attention by products manufacturers during 1933. These are New York, Chicago, Detroit, and Boston. Several others will probably be started during the year. While building code revision work requires a great deal of time and occasionally seems to be unprofitable, it is well worth the time of every products manufacturer to know that the interests of his material are properly represented wherever building code revisions are under way.



The walls of Berks County Prison, Reading, Pa., stand as an impressive example of the architectural possibilities of coursed concrete ashlar masonry. Colors of units vary from light buff to chocolate brown. Alfred Hopkins and Associates, architects

Where to Look for Business

1933 will reward sales fighters. Business will be hard to get; there won't be a lot of it, but it is certain that only those who fight hard will get it. Here are the places to look for it:

1. The small, low-cost, fireproof home market;
2. Slum clearance in many communities;
3. Unemployment relief construction;
4. Government building; and,
5. Concrete ashlar for new or modernizing work.

Let me repeat that, so far as the individual manufacturer is concerned, the amount of business he gets from these five sources depends on how hard he fights for it.

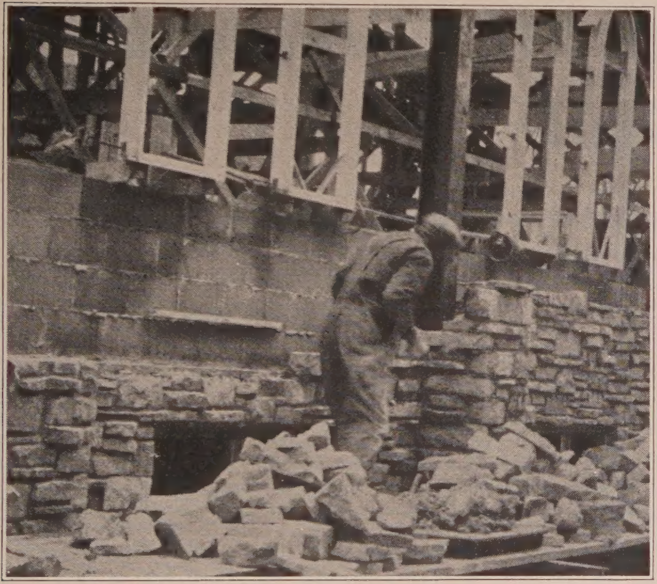
Buff-Colored Concrete Units Produce Beautiful Church Interior

Used with Monolithic Concrete and Rough Quarry Stone for Economical Exterior Walls—Colored Units and White Mortar Joints Eliminate Plaster

An inner finished facing of concrete building units, an exterior facing of rough stone from a nearby quarry, and a mixture of concrete placed between the interior and exterior facing units as the work proceeded, constitute the exterior wall construction of St. John's Church, a building just being completed at the corner of South 26th and West Mineral streets in Milwaukee, Wis.

Wall Construction a New Idea

This type of exterior wall section and the manner of its construction are both new in Milwaukee. The architects, Kirchhoff & Rose, devised this method of procedure because of its evident economy.



An interior facing of concrete units, an exterior of rough quarry stone, with monolithic concrete between, produce economical wall construction in church building

Concrete Units Eliminate Plaster

To begin with, the selection of the type of concrete units employed as the finished interior facing eliminated all interior plaster work, for the concrete units comprise the finished surface of all interior walls and partitions on the main floor, as well as for the interior surface of the outside walls.

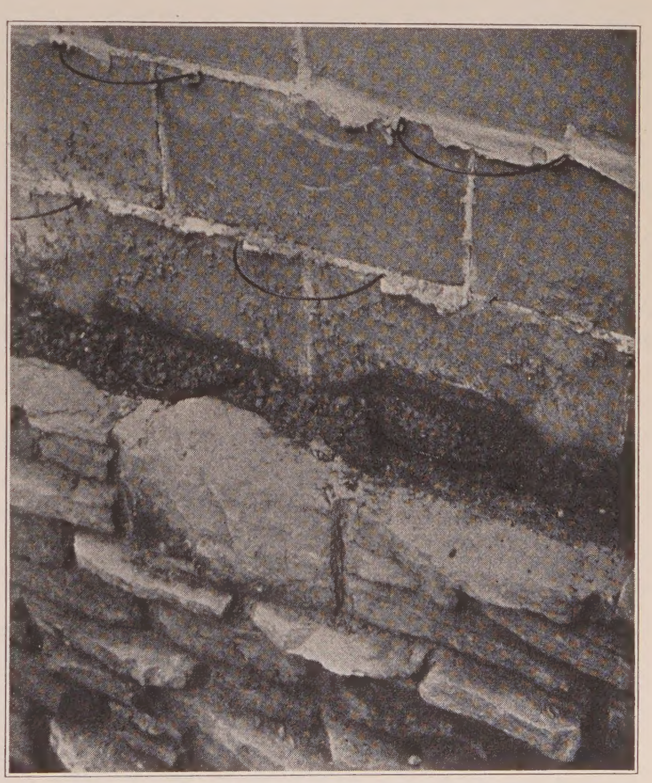
The concrete units, which have a wall face of 8 by 16 in. and a thickness of 4¾ in., were made of specially selected aggregate, portland cement and a buff mineral color. The exposed surface of the units is very smooth. Joints were laid close, with a white, quick-setting and non-staining mortar, and finished in what is known as a weather joint on exposed surfaces. No stain, paint or other form of decoration was applied to the interior face of the concrete units. These units in themselves, together with the white joints, provide an extremely soft and pleasing appearance, one that can be fully appreciated only by actually seeing it.

Method of Building Exterior Walls

Both the concrete units on the inner face and the rough stone exterior facing were laid up in stages about 2 ft. high. The quick-setting mortar in which the 4¾-in. concrete units were placed made it possible to utilize them as forms for the concrete, without the necessity of bracing them.

The rough exterior stone was laid up dry. Then, when the concrete was placed between the two wall faces, it was allowed to fill the joints between the stones. Some experimenting was necessary to get the concrete of the proper consistency, so it would fill the joints without flowing out too freely. The joints were then raked out, as may be seen in the close-up illustration.

The coarse aggregate employed in this concrete was of small size, not exceeding ⅜ to ½ in., and the cement was a light-colored brand. The resulting concrete, as seen in



Close-up view of wall construction

the finished exterior joints, is light gray in color, of the same general effect as the stone.

The close-up view also shows how wire loops were placed in the horizontal joints of the concrete units and extended outward far enough to engage the exterior facing stones and help to hold them in place until the concrete was placed and hardened.

Find Wall Construction Economical

The stones were used as they were broken up in the quarry. They were not dressed in any way. In some cases the stone masons broke the stones to fit them better into place, but this was done as the work proceeded.

This form of wall construction was found to be unusually economical. The exterior stones cost very little, while as previously stated, the use of the smooth, buff-colored concrete units for the interior finish eliminated the need for plaster, stain or paint.

In the basement some of the wall surfaces are of the same type of buff-colored concrete units that were employed on the main floor. The greater part of the wall area in the basement rooms, however, is finished in monolithic concrete, to which a coat of white cement paint was applied. Plywood was used as concrete form material, to obtain a smooth and true surface.

Throughout the entire building, wherever reinforced concrete floor slabs were built, the ceiling surface underneath was formed with plywood and finished with a coat of white cement paint applied directly to the concrete.

The interior trim around doors and windows in the main auditorium and entrance consists of cast stone, also set in white non-staining mortar.

Acknowledgments

The Best Block Company, of Milwaukee, manufactured the concrete units used in this work, for which Daniel B. Danielson had the general contract. The architects are Kirchhoff & Rose, 710 No. Plankinton Street, Milwaukee.

Urge Building to Aid Business Revival

Road Show Draws Many Groups to City—Organizations Hold Separate and Combined Meetings

"ECONOMIC Recovery Via the Construction Route" was the keynote of the busy round of annual meetings, conferences and group meetings held in Detroit during the week of the highway and building exposition and road show, under the auspices of the American Road Builders Association.

The various groups comprising the American Road Builders Association held their sessions in the meeting rooms at the Detroit Municipal Airport, where the machinery exhibit was held.

National organizations such as the American Society of Municipal Engineers, the Associated General Contractors, the National Sand and Gravel Association, the National Crushed Stone Association, and the National Ready-Mixed Concrete Association, held their annual meetings at downtown hotels.

It would be quite out of the question to give up sufficient space in this issue to describe even the highlights of the various meetings. A better service at this time will be that of giving our readers an outline of the various papers and reports that deal with some phase of concrete construction. The next step will be to prepare and publish, for the information of our readers, abstracts of the papers and reports having outstanding value to the concrete industry. This will be done in the successive issues of CONCRETE, in so far as these documents have been made available for publication. The titles of some of these papers and the various organizations before whom they were presented are as follows:

American Road Builders Association—

Report of Committee on Reinforced Concrete Pavements, by C. E. Foster; Plain and Reinforced Concrete Pavements, by H. F. Clemmer; Report of Committee on Use of Concrete for Low-Cost Road Construction, by E. N. Gustafson; The Use of T. R. C. for Low-Cost Road Construction, by T. A. Pearson; A Farm-to-Market Program for Massachusetts, by L. O. Marden; Design and Construction of Low-Cost Bridges, by Howard B. Keasbey; Report of Committee on Concrete Pipe Culverts, by R. L. Litehiser; Highway Program of the Nation, by Willard T. Chevalier; What Highways Mean in the Economic, Educational and Social Life of the United States, by Thomas H. MacDonald; Cost to the American Public of Diversion Taxes from Their Lawful Purpose, by Ernest N. Smith; Interest of the Farmer in Adequate Highways, by Chester H. Gray; A Balanced Highway Program, by Grover C. Dillman; Economic Reconstruction via the Construction Route, by E. J. Mehren; and Stimulating Construction Recovery by Proper Legislation, by George B. Walbridge.

National Ready-Mixed Concrete Association—

What the National Ready-Mixed Concrete Association Means to the Industry, by H. F. Thomson; A Purchase Specification for Ready-Mixed Concrete (report of committee co-operating with the A. S. T. M.), by R. B. Young; Use of Ready-Mixed Concrete in Highway Construction, by H. P. Chapman; Use of Ready-Mixed Concrete in Cold Weather, by Miles N. Clair; and The Future Demand for Concrete, by W. D. M. Allan.

National Sand and Gravel Association—

What the National Sand and Gravel Association Has Saved Its Industry, by John Price; Plant Inspection of Aggregates Under Modern Specifications, by W. J. Emmons; and Report of Director, Engineering and Research Division, by Stanton Walker.

Associated General Contractors of America—

Social and Economic Value of Highway Construction, by Roger L. Morrison; Future Possibilities of Highway Construction, by O. W. Merrell; Reviving Construction Through Self-Liquidating Projects, by F. L. Cranford; and Selling a City-Wide Construction Program, by George B. Herington.

Co-Ordination of Basic Principles of Concrete Mixtures

Talbot-Richart Application of Absolute Volume in Design of Concrete Mixtures Reviewed in Tenth Article of Series on Concrete Technology

X—Needed Laws of Mixtures and Known Fundamentals (Continued)

By **JOSEPH A. KITTS**
Consulting Concrete Technologist, San Francisco, Calif.

THE first notable application in the United States of an absolute volume technique in concrete mixture research is recorded by Professors Arthur N. Talbot and Frank E. Richart in "The Strength of Concrete: Its Relation to the Cement, Aggregates, and Water," Bulletin No. 137, Engineering Experiment Station, University of Illinois, October 15, 1923. The principles and methods employed were introduced by Prof. Talbot in "A Proposed Method of Estimating the Density and Strength of Concrete and of Proportioning the Materials by the Experimental and Analytical Consideration of the Voids in Mortar and Concrete," *Proc.* A. S. T. M., Vol. 21, p. 940, 1921. The technique of tests and analysis are fundamentally those employed by Feret and described by him in *Bulletin de la Societe d-Encouragement pour l'Industrie Nationale*, 1897. The tests termed Series 2G were undertaken in 1919, in co-operation with Committee C-9 of the American Society for Testing Materials, to obtain information on the laws of mechanical mixtures and on the relation between the gradation of aggregates (fine and coarse) and the strength of the resulting mortars and concretes. The tests termed Series 211 were undertaken in 1921 to investigate the mortar-voids characteristics of fine aggregates and their relation to the concrete-making properties of the materials, together with the development of methods for applying the principles so derived to the production of concrete.

Scope of Bulletin 137

Bulletin 137 enunciates relations between the compressive strength and the amount of cement and voids in concrete. It develops methods for comparative and acceptance studies of the concrete-making properties of aggregates. It outlines methods of formulating mixtures for different densities and strengths when the voids in mortars of given cement and fine aggregates have been determined by laboratory tests. Means are proposed for estimating the effect of increase in the amount of mixing water upon strength and density. The absolute volume technique is described and the analytical relations developed. The practical and technical convenience of the use of absolute volume proportions of ingredients, in analysis and calculation, in estimating quantities, in making comparisons, in judging effects, in visualizing the structure of a concrete mixture and its inherent physical relations, and in translating from laboratory to field measures, is brought out, and advances a more scientific technique in concrete research and production.

The water content relations of the mortars and concretes are given in terms of "basic water content," which is defined as that amount of mixing water which results in producing the minimum volume of concrete, or, the water content for maximum density. This is a good definition of what has been indefinitely described as "normal consistency," and is a definite, scientific, and satisfactory basis in contrast with the older expression. This idea shows scientific progress in conception of concrete physics.

The weight-volumetric technique (See Part II, CONCRETE, June, 1932) is employed in the determination of density, voids and yield of mortar and concrete.

The adoption and use (in Series 2G) of a uniform grading equation, having a flexibility which permits uniform grading of any practicable fineness modulus with any maximum size of aggregate, is a very important development; and the data of tests, showing the effects of variations of grading from fine to coarse on the strength, density, yield, water-cement ratio, voids-cement ratio, cement-space ratio, and their interrelations, form a valuable record of concrete physics which supplies certain deficiencies of earlier records.

Series 2G mixtures are limited to 1:5 bulk volume* proportions and normal consistency, include ten maximum size groups of aggregates, and each group includes from five to ten different gradings as determined by the value of n in the equation—

$$p = 100(d/D)^n \quad . \; . \; . \; . \; . \; . \quad (39)$$

in which p is the percentage of aggregate passing given sieve opening of d width, D is the maximum size of particle of the given aggregate, and n is a variable exponent which determines the coarseness of grading.

Series 211 mixtures are limited to one maximum size of aggregate combined with various fine aggregates. The series is grouped into "Basic Water Content" and "Varied Water Content." The basic water content group covers a given coarse aggregate in combinations with each of 25 different types of fine aggregate, in two different ratios of fine to coarse, and in three different cement contents. The varied water content group includes a given coarse aggregate combined with each of three artificial gradings of fine aggregate, in three relative (to basic) water contents, and in three and four different ratios of fine to coarse aggregate. The bases of examination of concrete mixtures, as presented in Bulletin 137, represent the transitional phase of research from the bulk volume to the absolute volume technique. The absolute volume technique is being developed.

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*Although the absolute volume proportions of aggregate, cement and water are stated, the basis of proportions is 1 sack (94 lb.) of cement to 5 cu. ft. loose dry bulk volume of mixed aggregate.

Talbot-Richart Grading Equation

The grading equation employed in Series 2G may be written—

$$p = (d/D)^{n} \qquad (39a)$$

and also— $r = 1 - (d/D)^{n}$ . . . . (39b)

or— $\log p = \log (1 - r) = n(\log d - \log D)$. (39c)

in which p is the proportion (instead of per cent) passing, and r is the total proportion retained on any sieve opening of d width, D is the maximum size particle, and n is an exponent.

When $n = 0.5$ the grading curve is a parabola and is identical with the Fuller-Thompson parabolic grading, provided the sieve holes are the same shape (square or round) in each case.

On order to determine the fineness moduli of the various gradings, Talbot and Richart employed the Abrams screen scale and thus co-ordinated the fineness modulus principle with a uniform grading principle in a manner applicable to laboratory use.

From the equation it is seen that with a given maximum size of aggregate, D, variation in fineness or coarseness (fineness modulus) of gradation may be obtained by varying the value of n; with $n = 0.5$ the curve is a parabola and represents a medium grading, and with $n = 1.0$ the curve is a straight line and represents a very coarse grading. In the preparation of the aggregates according to the sieve analyses predetermined by equation (39), the sand and gravel were first screened to the sizes indicated by the following Abrams sieve scale: 0 to 100, 100 to 48, 48 to 28, 28 to 14, 14 to 8, 8 to 4, 4 to ⅜ in., ⅜ in. to ¾ in., ¾ in. to 1 in., 1 in. to 1½ in., and 1½ in. to 2 in. These sizes were re-combined in the proportions as predetermined by the equation for the required aggregate mixture.

Comparison of Regular and Irregular Gradings

No direct comparisons are available of the effects of regular and irregular gradings of aggregates on the strengths and densities of the concretes of Series 2G, as the mixtures of irregular gradings differ from those of regular gradings in cement content, or water-cement ratio, or fineness modulus, or in two of these three variables. However, the mixtures of irregular gradings may be compared (1) with those of regular gradings having the same or approximate cement content (giving consideration to the fineness modulus and water ratio), (2) with those having the same or approximate fineness modulus, and (3) with those having the same or approximate water-cement ratio. Then, by taking the average strengths and densities of these three groups of comparisons, we have an index of the relative effects of irregular and regular gradings of aggregates on the strengths and densities of the concretes.

Thirty-six comparisons of the irregular and regular gradings of Series 2G show that the regular gradings are superior in strength and density, with one case which might be considered an exception. The averages show that the regular gradings have 30 per cent greater strength and 5 per cent greater density and are as follows:

AVERAGES OF 36 COMPARISONS, SERIES 2G

Gradings	Cement	f.m.	W/C	Strength	Density
Irregular	0.0904	3.704	1.104	1,352	0.744
Regular	0.0874	3.743	1.111	1,775	0.785
$\frac{\text{Regular}}{\text{Irregular}}$	0.97	1.01	1.01	1.31	1.05

Comparing the 1-in. maximum aggregate regular gradings of Series 2G with the Series 211 irregular gradings, we obtain results as shown in Table 8. The regular gradings show 38 per cent greater strength and 6 per cent greater density than the irregular gradings, the average values being: $S = 3{,}142$, $d = 0.858$; and $S = 2{,}280$, $d = 0.807$, respectively. The individual comparisons and their distinguishing cylinder numbers are given in Table 8.

As a further check on the relative strengths of the concretes of regular and irregular gradings, let us employ the Talbot-Richart equation of strength based on the cement-space ratio—

$$S = 32{,}000\left(\frac{c}{v+c}\right)^{2.5} \qquad (40)$$

$$\text{or } \log S = 4.50515 + 2.5 \log \left(\frac{c}{v+c}\right) \qquad (40a)$$

in which c is the absolute volume of cement and v is the corresponding volume of voids (air and water) in a unit volume of concrete.

TABLE 8. COMPARISON OF STRENGTHS AND DENSITIES OF CONCRETES WITH REGULAR AND IRREGULAR GRADINGS OF AGGREGATES. FROM TABLES 2 AND 6, BUL. 137, UNIV. OF ILL. SIZE OF AGGREGATE IS 1 IN. MAXIMUM IN ALL CASES

Series 211					Series 2G				
Irregular Grading					Regular Grading				
Cyl. No.	c	W/C	S	d	Cyl. No.	c	W/C	S	d
1—51	0.100	0.86	1890	0.788	74	0.088	0.86	2740	0.843
53	.102	1.07	1230	.732	72	.082	1.09	1850	.800
2—73	.100	.86	2180	.829	74	.088	.86	2740	.843
3— 1	.099	.67	2700	.841	76	.099	.64	3670	.880
2	.099	.78	1980	.812	75	.092	.74	3320	.860
4— 6	.100	.74	2000	.817	75	.092	.74	3320	.860
8	.100	.56	2690	.849	77	.100	.61	3800	.886
5—40	.099	.72	1920	.810	75	.092	.74	3320	.860
41	.100	.82	1410	.773	74	.088	.86	2740	.843
6—54	.098	.74	3330	.816	75	.092	.74	3320	.860
55	.099	.85	2720	.798	74	.088	.86	2740	.843
7—58	.098	.85	1410	.791	74	.088	.86	2740	.843
59	.091	.62	2180	.790	76	.099	.64	3670	.880
8—75	.098	.71	2200	.794	75	.092	.74	3320	.860
77	.100	.85	1390	.756	74	.088	.86	2740	.843
10—47	.100	.94	1180	.756	73	.086	.96	2270	.836
13—27	.099	.63	2420	.830	76	.099	.64	3670	.880
28	.097	.55	3210	.846	79	.102	.55	3350	.872
19—32	.099	.64	2780	.849	76	.099	.64	3670	.880
33	.101	.76	2060	.819	75	.092	.74	3320	.860
22—23	.100	.64	3010	.845	76	.099	.64	3670	.880
Average	.099	.755	2280	.807	----	.093	.762	3142	.858
Per cent	100	100	100	100	----	94	101	138	106
$\frac{c}{v+c}$		0.3390					0.3957		
S (By Eq. 40)			2141	(100%)				3152	(147%)

We obtain from Table 8 the values in Table 9.

These indications of 5 to 6 per cent greater density, and 31 to 47 per cent greater strength, of the concretes in which the aggregates are uniformly graded, confirm the Fuller and Thompson findings at Jerome Park Reservoir in 1904, and show, quite conclusively, the necessity and importance of uniform grading of the aggregates in the mix if uniform and high values of strength and density are sought, for any given conditions of cement content, maximum size and consistency. They prove the high efficiency of the Talbot-Richart grading equation, and show the value of separating the aggregates into as many sizes as practicable as a preliminary to combination in uniform gradings.

TABLE 9. RELATIVE STRENGTHS BASED ON THE TALBOT-RICHART EQUATION

Average Physical Values of the Concrete		Type of Aggregate Grading Irregular	Regular
Cement content	c	0.099	0.093
Voids	v	0.193	0.142
Cement-space	$\frac{c}{v+c}$	0.3390	0.3957
Strength by Equation 40	S	2,141	3,152
	%	100	147

In view of the efficiency of the Talbot-Richart grading equation, and its mathematical simplicity and adaptability to any maximum size and fineness modulus, it amply satisfies our Requirement 5—the grading equation for the given fineness modulus and maximum size of aggregate. The method of its practical adaptation was developed by the author during the period 1924 to date and will be presented in a subsequent number.

Bulk Volume Proportions and Cement Contents

The meaninglessness of bulk volume proportions is shown quite definitely by the 1:5 bulk volume proportions of Series 2G, and should be noted. It is found that the cement content of the 1:5 proportions, for a given maximum size of aggregate and consistency of mix, varies from 0.082 to 0.103; in other words, from 427 to 537 lb. of cement per cu. yd. of concrete, due to variations in the fineness of grading and corresponding densities of the aggregates. The greater cement contents for the fixed bulk volume proportions are generally shown by the coarser gradings, and vice versa.

Maximum Practicable Fineness Modulus

The values of n, for the gradings of the Series 2G mixtures, are varied from 0.24 to 1.20, producing mixtures varying from extremely fine gradings to extremely coarse, for the several maximum sizes of aggregate. Plotting the strengths against the W/C ratio (as is shown in Fig. 9, Bul. 137), it is noted that the strengths of the concretes, for a given maximum size of aggregate, follow a curve of the form—

$$S = A/B^{w/c} \quad . \ . \ . \ . \ . \ . \ . \ . \ . \ . \ (21)$$

from fine to coarser gradings until an optimum or maximum permissible coarseness (fineness modulus) is reached, after which the strengths of the still coarser gradings fall below the water-cement ratio-strength curve and finally retrogress in strength as the gradings become extremely coarse. Likewise, the strengths of the finer gradings of each maximum size of aggregate take their place along the water-cement ratio-strength curve.

It is important to note, also, that the finer gradings require a greater W/C ratio for the given maximum size and consistency, and consequently show less strength than the coarser gradings up to the maximum permissible coarseness.

The coarse graded mixtures whose strengths fall below the water-cement ratio-strength curve prove to lack workability and cohesion and are impractical for general use. The practical mixtures follow the water-cement ratio-strength law.

Grading and Water-Cement Ratio Equally Essential

From the foregoing it is seen that, with given cement content, maximum size, fineness modulus, and consistency, the concretes of uniform gradings show 30 to 40 per cent greater strength and 5 to 6 per cent greater density with a given water-cement ratio. Uniform grading increases the density, and this increase of density increases the strength independently of the water-cement ratio. This answers questions (1), (2) and (3) of Part VII (see CONCRETE, November, 1932).

Bulletin 137 made possible the co-ordination of the fineness modulus and uniform grading principles, and pointed the way to the practical use of the absolute volume as the basic measure of proportions. It contains further important information on the physics of mixtures which will be reviewed in the next number.

(To be continued)

PERSONALS

William E. McComas, district engineer of the Portland Cement Association at Philadelphia, Pa., passed away at his home at Germantown on January 17.

Mr. McComas was born in Baltimore and graduated from Lehigh University. He is survived by his wife, his mother, and a brother and sister.

E. W. Dienhart, well known to the concrete products industry, is now a member of the Cement Products Bureau staff, Portland Cement Association, Chicago, Ill.

At present he is engaged in research and promotion work in connection with development of precast concrete joists, reinforced, for use in building floors for residences, store buildings, factories for light manufacturing occupancy, and similar structures.

Mark Beeman, former secretary of the Concrete Reinforcing Steel Institute, Chicago, has been appointed manager of the Washington office of the Portland Cement Association.

Mr. Beeman assumes his new work February 1, succeeding Arthur C. Toner, who has been granted a leave of absence due to ill health.

R. W. Johnson, who has been in charge of the engineering work of the Concrete Reinforcing Steel Institute since the formation of that organization, succeeds Mr. Beeman as secretary of the Institute.

PROGRESS—In a Page

Current activities in research, in matters pertaining to concrete and cement, as being carried on or completed by various organized groups.

Constituents of Fresh Concrete Determined by Machine

A MACHINE for washing fresh concrete on sieves, in order to separate the ingredients contained in it, and to determine the proportion of each ingredient, is described by William A. Blanchette in the November (1932) issue of *Public Roads*, published by the United States Bureau of Public Roads, Washington, D. C.

One method frequently employed in determining the constituents of fresh concrete involves washing the concrete on a No. 100 sieve, reclaiming the cement from the wash water, dividing the aggregates into fine and coarse on the proper sieve, and calculating the weight of the water from the difference between the initial weight of the concrete and the dry weight of the reclaimed solids. A second method, known as the Dunagan method, consists of weighing the concrete in air and in water, washing out all material passing the No. 100 sieve, determining the weight of cement by differences in immersed weights, converting immersed weights of cement, fine aggregate and coarse aggregate to air weights, and determining the weight of water by differences in air weights.

Either of the foregoing methods requires that the sample of concrete be washed on sieves. The washing machine described by Mr. Blanchette may be utilized in either method.

Civil and Structural Engineering Extension Courses

FOR THE man whose interest lies in some phase of civil or structural engineering, the department of civil and structural engineering of the University of Wisconsin Extension Division at Madison is offering the advantages of its correspondence courses.

Courses are offered in architectural engineering, bridge engineering, building and construction estimating, building design and construction, highway engineering, plain concrete work, reinforced concrete bridge designing, reinforced concrete building designing, reinforced concrete engineering, structural engineering, and surveying.

These courses are of university grade in character and content and are designed to give a thorough preparation for technical work. Upon the satisfactory completion of a course, a student is awarded a University Extension certificate, which has a definite value.

Repair of Masonry Silos

DURING the summer of 1932 the department of agricultural engineering of the University of Wisconsin, acting under the direction of S. A. Witzel, agricultural engineer, repaired more than 20 masonry silos, including structures built of monolithic concrete, of concrete silo units, of stone, clay brick and clay tile.

The department has now issued a report covering this repair work. In each case the nature of the deterioration is described, and definite methods are given for making effective repairs.

The report on this repair work has been issued as Stencil Circular 125, November, 1932, under the title of "When the Silo Needs Repair." While the issue lasts, copies may be obtained by addressing S. A. Witzel, agricultural engineer, University of Wisconsin, Madison, Wis.

Adopt Federal Specifications for Concrete Brick

THE Federal Specifications Board has officially adopted a standard specification for concrete brick, for which the effective or mandatory date is set for February 15, 1933. From and after that date this specification, designated as SS-B-663, will be mandatory, so far as possible, upon all departments and independent establishments of the United States Government.

Copies may be obtained at 5 cents each from the Superintendent of Documents, Government Printing Office, Washington, D. C.

Glazed Coating on Concrete Products

BRITISH patent No. 373,695 has been granted to J. H. Ratcliffe covering a process for the glazing of concrete blocks, pipes or tiles, by coating with a titanium ore paint and heating in a kiln or heating chamber. The method is also applicable to sand-lime brick.

Inquiries about copies of this patent should be addressed to Patent Office, Industrial Property Department, Board of Trade, 25 Southampton St., London, England.

Testing Effects of Clay Admixture

TESTS are being conducted at Rensselaer Polytechnic Institute, Troy, N. Y., to determine the effects on strength and permeability of concrete when small quantities of cement are replaced by equal weights of finely divided clay.

The experiments have been under way for about 2 years, and present plans call for continuance of the tests for about 2½ years more.

Significance of Tests of Quality and Strength

A SYMPOSIUM on the significance of quality and strength tests of concrete has been announced as an important feature of the program at the 1933 annual meeting of the American Society for Testing Materials, to be held at the Stevens Hotel, in Chicago, June 26 to 30.

EDITORIAL

1933 Gains Benefit of R. F. C. Loans

BY the end of 1932 not a single self-liquidating project on which the R. F. C. has authorized loans had reached the stage of actual construction.

The early months of 1933 will see the beginning of work on some of these projects, and the first of June should see many of them under way.

In a word, the construction industry of 1933 will gain the benefit of the groundwork laid in 1932.

It is a matter of common knowledge that the fund of 120 million dollars made available by the Federal Relief Act for federal-aid highway construction proved to be a definite stimulant in the latter months of last year.

If even half the credit made available by the larger fund of a billion and a half is actually translated into work on self-liquidating projects, the stimulant to the construction industry will be felt in every direction.

Every possible form of support should be extended to the national organizations that are trying to stimulate business recovery through the utilization of the credit provided in the Federal Relief Act.

Don't Overlook the Small R. F. C. Projects

AN editorial on the cover of the January issue of "Concrete" pointed out the stimulating effect that is sure to result from a self-liquidating construction project such as the bridge at New Orleans, on which the Reconstruction Finance Corporation authorized a loan of $7,000,000.

A similar, but even larger, bridge structure at San Francisco—also a self-liquidating R. F. C. project—will utilize 55 million man-hours of direct labor, 190,000 tons of structural and reinforcing steel, 1,000,000 barrels of portland cement, 1,000,000 cubic yards of sand and gravel, 107,000 square yards of paving, 200,000 gallons of paint, 40 million board feet of lumber, and construction equipment valued at $1,500,000.

"But these are big projects," some will say. "We'll not have many like them."

That is true; but let no one forget that a hundred small projects averaging $70,000 each will produce a stimulating effect equal to one project costing seven million.

Hundreds and even thousands of towns and small cities need sewage disposal plants, improved water supplies, and similar public improvements. Many of them have realized this need for years, but have not been able to finance the necessary construction.

Now the opportunity is placed before the public officials of these towns and cities. Projects of this character are among those on which R. F. C. loans have been authorized. Their construction will stimulate business in every section and every community in which the work occurs. While the benefit from a single small project will be small in its effect, the combined influence of thousands of small projects spread over the entire country will be felt in many industries.

Public officials who push the advantage afforded by this great opportunity will contribute their share, however small, toward business recovery.

More of This Enterprise Needed

CONTRACTS have just been signed for eight miles of salt sea marsh embankment and five bridges over various estuaries of the Pearl river, says the "Digest of New Orleans News" of January 7.

These contracts, involving an outlay of more than $1,000,000, provide for work to start immediately and also contemplate the awarding of a contract for the construction of an interstate bridge over the Pearl river at Pearlington, Miss., before the end of January.

A contract for a $14,000,000 bridge over the Mississippi river at New Orleans, on which the R. F. C. loaned half that amount, was signed in December and work was started in January.

Both of these contracts are the result of a determination to go ahead without waiting for somebody else to start something. California has shown similar energy, on a much larger scale.

If a good dose of the enterprise being displayed in Louisiana and California were injected into the so-called business leaders of the North and East, the construction industry would soon be leading the parade back to prosperity.

Construction Starts the Year Right

ALL through 1931 and 1932 the monthly reports issued by the F. W. Dodge organization showed construction contracts falling well below the corresponding months of the previous year. Only toward the end of 1932 did the gap begin to close.

It is, therefore, gratifying and encouraging to read, in the first Dodge report for 1933, that contracts awarded for new construction in the 37 states east of the Rocky Mountains during the first half of January reached a greater total, in dollars, than in the corresponding period of 1932.

Not since June, 1930, has the construction industry enjoyed the thrill of a similar report. May the new order of things continue!

Determines Sub-Sieve Fineness of Portland Cement

New and Rapid Method Described—Rational Expression of Effective Fineness—Influence of Effective Fineness on Some Characteristics of Cement

By **E. W. REED-LEWIS**
Director of Research, The Super Cement Company, Detroit, Mich.

OF recent years, increasing attention has been directed toward the study of particle-size distribution in portland cement, particularly in the ninety-odd per cent of this product that passes through the No. 200 sieve. One of the chief impediments to the advancement of these studies of sub-sieve fineness has been the high cost of the necessary laboratory equipment and the time involved in making determinations with it. A reliable "air elutriator," capable of making separations at several sizes down to a nominal particle diameter of 10 microns, would cost several hundred dollars, and usually the time required to make one complete fineness analysis would occupy most of a working day.

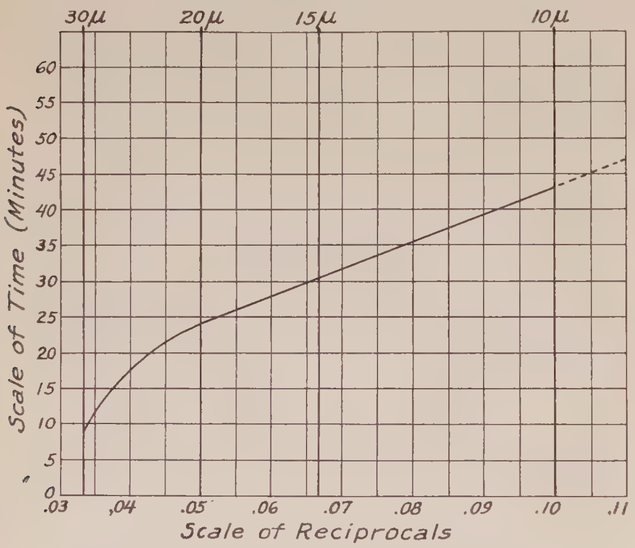

Figure 1. Time of suspension plotted against reciprocals of particle diameters

There has been developed during the past year, in the laboratory of the Super Cement Company, a simple apparatus known as the "Super Cement Fineness Analyzer," by means of which the particle-size distribution of cement is determined with satisfactory accuracy by sedimentation in a column of "butanol" (normal butyric alcohol). The cost of this apparatus is trivial; one man can readily operate two sets concurrently and, by so doing, can complete from ten to twelve fineness analyses down to a 10-micron separation in the course of a day's work, making intermediate separations wherever desired below 40 microns.

The apparatus consists essentially of a burette of suitable dimensions, supported in a vertical position, filled to a definite height with "butanol" and maintained at a constant temperature throughout the test.

The test procedure is to agitate the butanol in the burette by bubbling air through it at a constant rate, introducing this air through the stopcock at the bottom of the burette. A one-gram sample of the cement to be tested is then introduced into the butanol through the top of the burette and the agitation by bubbling is continued for precisely 15 minutes. When the air is shut off, sedimentation commences. At subsequent appropriate time intervals, the cement that has come to rest at the bottom of the burette is drawn off through the stopcock. These fractions of the original sample are recovered in individual glazed porcelain crucibles, or small glass beakers. The small quantity of butanol drawn off with each fraction is evaporated by heating, and the dry fractions are weighed.

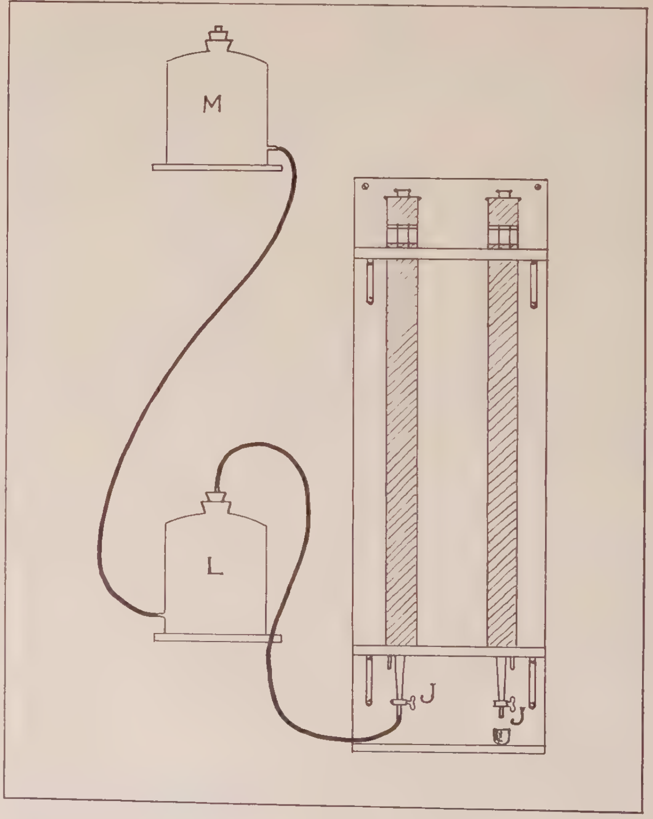

Figure 2. Diagram of apparatus set up for operation

During the 15-minute bubbling period the recurring upward impulses of the air bubbles ascending through the butanol produce a partial segregation or classification of the cement particles in suspension, the smaller particles congregating toward the top of the burette, the coarser particles toward the bottom. When bubbling is terminated and the column of butanol becomes quiescent, this segregation of particle sizes is, of course, accentuated, since all particles then tend to follow Stoke's Law without disturbance.

The successive fractions of the cement sample, drawn from the burette at intervals throughout the duration of the test, are, therefore, composed of particles which are progressively smaller in size.

It is the practice in the laboratory of the Super Cement Company to draw off these fractions at time intervals which correspond to nominal separation sizes of 30, 20, 15 and 10 microns, though separations have been made down to 4 microns; and it is, of course, only a matter of extending the duration of the test to get separations down to 1 micron or less, if this should be considered desirable.

Calibration of the apparatus at any constant temperature and with any particular consignment of butanol is a comparatively simple matter; and, since the viscosity of butanol varies with temperature, and no two consignments of commercial butanol can be relied on to have precisely the same viscosity at any given temperature, it is obviously essential that this be done.

Methods of Calibration

Calibration may be accomplished by preparing slides from the fractions drawn off at frequent time intervals, using any sample of cement; these slides may then be examined with the aid of a microscope and a projector and direct measurements of the particle sizes taken on the projected image. In this way, the time intervals corresponding to any desired separation sizes can be established.

This method of calibration, however, has several objectionable features. In the first place, relatively few laboratories are equipped with suitable microscopes and projectors; in the second place, the preparation of slides and the measurement of hundreds of particles is a procedure that consumes many very tedious hours; finally, it is surprisingly difficult to get any two operators into agreement as to the mean particle diameter represented by a given slide, or even on the procedure that should be followed in making such a determination.

Believing that it is more significantly desirable to have associated laboratories "talking the same language" than it is to have them quibbling over whether a given particle of cement has a mean diameter of 10 microns or 9.642, the laboratories now using the Super Cement fineness analyzer, about twenty at the moment, have adopted the practice of calibrating on a sample of pulverized fluorspar of stated fineness, standardized and supplied by the Super Cement Company.

Calibration by means of this standard fluorspar sample is accomplished by running it through the fineness analyzer, drawing off fractions at 5-minute intervals from zero time up to 25 minutes, and at 10-minute intervals thereafter up to 75 minutes.

The test should preferably be repeated at least four times, and the average of the four or more determinations then plotted on squared paper against a horizontal scale representing time, and a vertical scale representing percentage of the sample still in suspension. The known percentages of the standard sample minus 30 microns, minus 20 microns, minus 15 microns and minus 10 microns can then be spotted on this curve and the corresponding "sedimentation times" read off the horizontal scale.

If the "sedimentation times" have been correctly determined in such a calibration test, those corresponding to separation sizes of 20, 15 and 10 microns should fall on a straight line, as in Figure 1, when time is plotted against a natural scale of the reciprocals of particle diameters. If it is desired to make separations at nominal diameters other than those of the standard sample, it is only necessary to project this established straight line to arrive at the correct "sedimentation times" for any desired separation size.

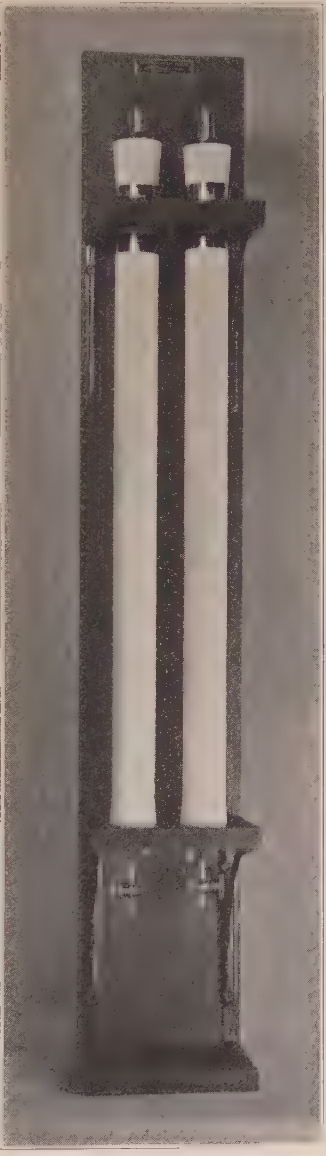

Figure 3. Pair of water-jacketed burettes, mounted for convenient operation

Details of the Apparatus and Its Operation

Figure 2 shows the apparatus set up for operation, with two aspirator bottles to supply the necessary air pressure for the bubbling operation. Figure 3 is from a photograph of a pair of the water-jacketed burettes, suitably mounted for convenient operation.*

The burette differs in shape from the usual in having a tapered section above the stopcock, the purpose of which is obvious. Two graduations only are necessary, one 30 in. and the other 32 in. above the stopcock. A constant temperature of the butanol in the burette throughout the test being essential, the burette is insulated with a water-jacket, and is further protected from the disturbing influence of radiant heat and light by an opaque covering of surgical tape. Where room conditions are such that this protection is not sufficient to maintain the temperature of the butanol in the burette constant within 1 deg. F. throughout the period of the test, further insulation should be provided to insure this, such as enclosing the whole apparatus in a thermostatically controlled cupboard.

As indicated in Figure 2, suitable air

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*The water-jacketed burettes, mounted as shown in the photograph, may be obtained from Scientific Instrument Company, Detroit, Mich.

pressure for the bubbling operation can be provided by means of two aspirator bottles of about one gallon capacity each, with a differential head of 5 ft. Butanol is used in these bottles so that the air, as it enters the burette, will already be saturated with respect to butanol, thus minimizing evaporation in the burette and consequent temperature change during the bubbling operation.

Test Procedure in Detail

The water-jacket being filled with water at the adopted temperature, and the burette filled to the 30-in. graduation with butanol at the same temperature, the rubber tube from the air pressure chamber "L" (Figure 2) is fitted to the bottom outlet of the burette, the reservoir "M" is raised to a shelf 5 ft. above "L," and 1 minute is allowed to build up sufficient air pressure. The burette stopcock "J" is then carefully opened, sufficiently to permit air to commence bubbling into the burette. The flow of air is next regulated by means of this stopcock to a point where the level of the butanol in the burette stands at the 32-in. graduation. With a little practice, this adjustment of the flow of air can be made within 30 seconds. However, it is good practice to allow 60 seconds for this adjustment.

Having adjusted the flow of air, and the 60 seconds having expired, a one-gram sample of the cement to be tested, having previously been brushed through a No. 80 sieve, is introduced into the top of the burette, washed down with 5 c.c. of butanol and the aid of a rubber policeman, and the bubbling is continued for precisely 15 minutes. No attempt should be made during the bubbling period to further regulate the flow of air; the slight diminishment of flow, due to loss of head in the reservoir, is a constant factor in each test, and, consequently, negligible. At the end of the 15-minute bubbling period the flow of air is shut off by closing the stopcock "J," the tube is removed from the end of the burette, and the stopcock then opened slightly to release the bubble of air that usually "hangs up" in the stem of the burette, immediately above the stopcock.

Taking times with precision by a stop watch, the fractions are then carefully drawn off at the determined times through the stopcock "J." With practice, the accumulated fraction can be drawn off cleanly without including much more butanol with it than a volume equal to that of the fraction of cement itself. A suitable vessel to receive the fraction as it is drawn off from the burette is a "Coors" glazed porcelain crucible, size "00," or a glass beaker of somewhat similar capacity. In drying the fraction, by evaporating off the butanol, a slow, even heat should be used, to avoid "spitting" and consequent irrecoverable loss of an unknown portion of the fraction. The dried fractions should be cooled in a desiccator before weighing.

Degree of Concordance Attainable

In a recent series of co-operative tests between six different laboratories using the Super Cement fineness analyzer, the results in Table 1 were reported on one sample of cement.

In these co-operative tests, the different laboratories each adopted their own most convenient temperature at which to operate the apparatus; these temperatures varied over the range between 67 and 90 deg. F.; butanol from local stocks, of widely different viscosities, was used; these variable factors resulted in the use of "sedimentation times" that differed as much as 100 per cent between the laboratories.

TABLE 1

UNIFORMITY OF RESULTS IN SIX LABORATORIES

Laboratory	Particle Sizes, in Microns				
	—30 mu.	—20 mu.	—15 mu.	—10 mu.	C.E.F.
No. 1	52.4%	36.5%	32.4%	25.6%	5.75%
No. 2	53.7	37.5	32.2	26.2	5.83
No. 3	51.0	39.7	34.6	27.0	5.91
No. 4	53.4	37.0	30.7	23.4	5.61
No. 5	53.3	37.1	31.6	24.9	5.72
No. 6	53.1	37.6	32.2	23.7	5.64
Average	52.8	37.6	32.1	25.1	5.74
Mean variation from average	0.75	0.73	0.95	1.13	0.087

The four determinations on one sample of cement recorded in Table 2 will serve to illustrate the degree of concordance attainable in any one laboratory with proper control. These four determinations were made in the same laboratory, with the same apparatus and the same consignment of butanol, by the same operator, but on different days.

TABLE 2

UNIFORMITY OF RESULTS IN SAME LABORATORY

Determination No.	Particle Sizes, in Microns				
	—30 mu.	—20 mu.	—15 mu.	—10 mu.	C.E.F.
No. 1	69.7%	51.6%	46.0%	37.5%	7.54%
No. 2	69.9	52.3	46.8	37.8	7.59
No. 3	69.8	52.2	46.5	38.1	7.60
No. 4	69.4	51.7	46.2	37.9	7.57
Average	69.7	52.0	46.4	37.8	7.58
Mean variation from average	0.15	0.30	0.28	0.18	0.02

In Tables 1 and 2 the column headed "C.E.F." represents a "Coefficient of Effective Fineness." This value, calculated from the fineness analysis, will be discussed later. At the moment it is only necessary to say that the "mean variation from the average" of 0.087, as between laboratories in the first tabulation, has a strength equivalent of about 60 lb. per sq. in. at 24 hours, and about 120 lb. per sq. in. at 28 days, on the basis of the compressive strength of concrete with a water-cement ratio of 0.8.

Similarly, the "mean variation from the average" of 0.02 in the second tabulation has a strength equivalent of about 15 lb. per sq. in. at 24 hours and 30 lb. per sq. in. at 28 days.

These strength equivalents are, obviously, well within the experimental error in respect to strength tests. Consequently it may be inferred that the determinations of effective fineness are sufficiently concordant for all practical purposes.

Acknowledgment

Without desiring to create any impression, which would be quite erroneous, that the Super Cement fineness analyzer has received any endorsement from the National Bureau of Standards, or from any member of its staff, the author does wish to acknowledge the many helpful suggestions obtained from the staff of the Bureau during the development of this method of test.

(*The second installment of this article will deal with the Coefficient of Effective Fineness as a rational expression of effective fineness in portland cement, and with the influence of "Effective Fineness" on some of the characteristics of cement.*)

Metal Forms Feature Construction of Sewage Disposal Plant

Use Straight Form Units on Circular Tank—Get Dense Concrete with Special Cement—Work Similar to the R. F. C. Projects

THE use of standardized metal form units in straight concrete walls, and the use of the same straight-faced units as forms for a circular tank on the same job, was an interesting feature of the construction of a sewage disposal plant at Norwalk, Ohio, in the late summer months of 1932.

Metal Forms Used Many Times

Metal forms to the amount of 6,000 sq. ft. were used on this contract, on a total form contact area of 45,000 sq. ft. In consequence, the form units were used 7½ times, on the average, on this work alone. Including other contracts on which the same form units were employed, they have had from 15 to 20 uses. To all appearances the units are in as good a condition as when they were new, and can be given many more uses.

Assembly of Form Units

The standardized form units were used much the same way for both circular and straight walls, even in the details of bracing. These standard wall units are 24 in. square, while horizontal adjustments in dimensions are made in increments of 1 in., with fractional units of various widths less than the standard. The fractional units have the same height (24 in.) as those of standard size, and have the same kind of attached clamps and aligning dowels for joining the units to each other.

Reference to the illustrations of both the straight and circular walls discloses how the forms were assembled and aligned horizontally and vertically with timber liners. The horizontal liners were clamped rigidly to each steel unit in a horizontal course. The vertical liners, in turn, were clamped to the horizontal liners; but the vertical liners and the bracing were used only on the inside of the wall, on both the straight and circular walls.

Using Form Units on Circular Walls

For the circular wall the form units, as stated, were assembled and braced in a manner similar to the straight walls. The difference in circumference between the outside and inside faces of the circular wall required the occasional use of a narrow, or fractional, form unit, so as to keep the slots for the wall ties opposite each other.

Another special detail in the form assembly for the circular wall was that the horizontal liners were sprung to the necessary radius of 40 ft., the tank being 80 ft. in diameter.

The scaffolding used in assembling the forms consisted of planks laid on brackets which were hung from the horizontal liners.

Spreader Wall Ties

Steel spreader ties were used on both the straight and the circular work. These ties were inserted in the usual way, placed loose in slots in the form units, after which the ends were given a quick quarter twist to keep them in place while the concrete was being deposited.

Dense Concrete with Special Cement

As a means of obtaining a high degree of density in the concrete itself, so as to avoid penetration of the liquid into the concrete, specifications called for the use of Super Cement, of which a total amount of 4,200 bbl. was used.

Similar to R. F. C. Projects

The work here described and illustrated is of special interest to the construction industry for another reason.

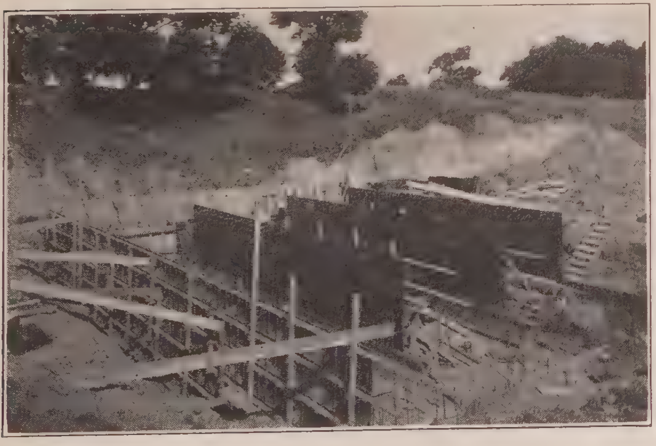

Figure 1. This new sewage disposal plant, under construction at Norwalk, Ohio, is typical of many similar plants expected to be built in 1933 through R.F.C. loans

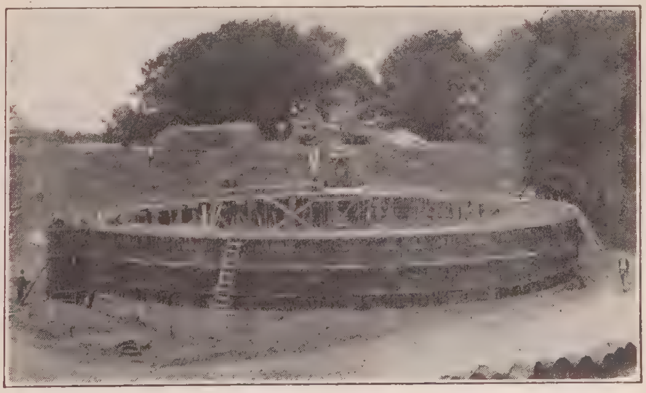

Figure 2. The standardized metal forms used for straight concrete walls in Figure 1 were also used as forms on this circular tank

While this work was not financed through the Reconstruction Finance Corporation, it is of a character similar to many self-liquidating projects which are expected to be built as a result of R. F. C. loans. Sewage disposal plants for various towns and cities have been approved for such loans, and doubtless many more will be given approval. Such work serves the three-fold purpose of creating employment, aiding in business recovery, and helping in the worthy effort toward eliminating stream pollution.

The general contract for the Norwalk sewage disposal plant was awarded to the H. G. Christman & Burke Company, Detroit, Mich. The contract price was $140,000.

Architects Invited to A. C. I. Session

Architects have been invited to attend and participate in the American Concrete Institute session on architectural concrete, on February 21.

The decorative concrete finish to be applied to the Baha'i Temple will be described and shown by John J. Earley, architectural sculptor of Washington, D. C. Discussion will center on the technicalities of producing and using color in monolithic concrete, of the architectural design, and of the construction problems involved in such work.

The American Concrete Institute Convention Program

To Be Held at the Palmer House, Chicago, Illinois, February 21, 22, 23 and 24

TUESDAY AFTERNOON, FEBRUARY 21

First Session—*Vibration of Concrete*

Papers by:

R. E. Davis, Professor Civil Engineering, University of California, "Compaction of Concrete Through Use of Vibratory Tampers."
T. C. Powers, Research Laboratory, Portland Cement Association.
Miles N. Clair, Vice-President, Thompson-Lichtner Co.

Discussions by:

M. I. McCarty, Electric Tamper & Equipment Co.
A. W. Munsell, Munsell Concrete Vibrators.
A. B. Shenk, Federal American Cement Tile Co.
G. B. Pickop, Malleable Iron Fittings Co.
A. C. Benkelman, Research Engineer, Michigan State Highway Department.
F. V. Reagel, Engineer of Materials, Missouri State Highway Department.
J. F. Brett, Montreal Water Board.

TUESDAY EVENING, FEBRUARY 21

Second Session

The Baha'i Temple, Wilmette, Ill.
Allen B. McDaniel, The Research Service, Washington, D. C.
John J. Earley, Washington, D. C.

Committee 409, Recommended Practice for Architectural Concrete Construction, Arthur R. Lord, Chairman. Presentation of the several parts of the report by the chairman and others of the committee. (A feature of the report will be an extensive exhibit of many panels, illustrative of the subject of the report.)

Committee 407, "Painting on Concrete Surfaces."
Brief discussions of the report by F. O. Anderegg* by W. B. Roberts, Aluminum Co. of America, E. R. Bridgwater of the E. I. Du Pont de Nemours & Co., Wilmington, Del., and others.

WEDNESDAY, FEBRUARY 22

Trips to Baha'i Temple, the Century of Progress Exposition, and the Planetarium.

WEDNESDAY EVENING, FEBRUARY 22

Third Session—*Hoover Dam*

"Mass Concrete Research for Hoover Dam," by Byram W. Steele.

"Cement Investigations for Hoover Dam," by Raymond E. Davis, R. W. Carlson, G. E. Troxell and J. W. Kelly.

"Comparison of Cements for Heat Generation, Strength, Flow Under Sustained Load, Volume Change and Elastic Properties Under Mass Concrete Conditions," by Arthur Ruettgers and R. F. Blanks.

"Development of Large Calorimeter Rooms and Automatic Temperature Controls for the Adiabatic Curing of Mass Concrete," by H. S. Meissner.

THURSDAY AFTERNOON, FEBRUARY 23

Fourth Session—*Hoover Dam (Continued)*

(The Concrete Masonry Association plans sessions for morning and afternoon.)

"Thermal Properties of Mass Concrete," by L. J. Snyder and C. S. Rippon.

"Effect of Size of Aggregate, Size of Test Specimen and Mix Proportions on Compressive Strength, Elastic Properties and Permeability of Mass Concrete," by Arthur Ruettgers and R. F. Blanks.

"Development of Apparatus and Technique for Measuring Elasticity of Mass Concrete," by Emile N. Vidal.

"An Eight-hour Accelerated Test for Field Concrete Control," by O. G. Patch.

THURSDAY EVENING, FEBRUARY 23

Twenty-ninth Annual Dinner

FRIDAY MORNING, February 24

Fifth Session

"Selecting Plant for Mixing and Placing Concrete—Meadowbrook Hospital," by John G. Ahlers.

"Some Economic Considerations of Ready-Mixed Concrete," by Herbert J. Knopel, Concrete Engineer, Warner Co.

"Relation Between Quality and Economy of Concrete," by Inge Lyse.

FRIDAY AFTERNOON, FEBRUARY 24

Sixth Session

"Rigid Frame Concrete Bridges," by J. W. Beretta.

Final Report Committee 105, "Reinforced Concrete Column Investigation," by F. E. Richart, Chairman.

"Studies of the Durability of Concrete Aggregates," by H. F. Gonnerman.

Report of Committee 902, "Concrete Pavement Standards," by F. C. Lang.

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*The report on which the discussion will be based was published in the *A. C. I. Journal*, September, 1932, and the December (1932) issue of CONCRETE, p. 13.

HOW TO DO IT

✦ Questions and Answers ✦
Consultation and Comment

A department devoted to the solution of problems encountered in concrete work. Readers are welcome to add to or improve upon the suggestions printed and to submit their views for possible publication.

Reinforced Concrete Railway Ties

I am developing a reinforced concrete railway tie and am anxious to obtain whatever may be available in pamphlets and articles describing the past performance of railway ties of this material. Can you refer me to data of this character?—N. A. C., Los Angeles, Calif.

We are asking A. C. Irwin, manager of the railways bureau of the Portland Cement Association, to send you certain data which he has assembled on this subject, and a blueprint of a drawing for a reinforced concrete railroad tie which he recommends as the minimum design that will meet the severe service requirements involved.

You will find that past experience with various types of concrete railroad ties has not been satisfactory, because for the most part they were designed by inventors who did not fully understand either the nature or the intensity of the loads to which the ties would be subjected. As might be expected, test installations of such ties have disclosed their defects.

Another factor which will be hard to overcome at this time is the low price at which creosoted wood ties can be bought and installed.

Under the circumstances it is our suggestion that any service tests which you may arrange should involve only a small number of ties, so as not to necessitate too great an expenditure. A short stretch of a few hundred ties subjected to heavy service conditions would tell the story almost as well as a stretch of several miles.

Heat Conductivity of Concrete

Can you refer me to authoritative information on the heat conductivity of concrete, including comparisons with other masonry materials?—V. B. L., Knoxville, Tenn.

Many investigations of this subject have been made and published. Bulletin No. 122, of the Engineering Experiment Station, University of Illinois, is a report of tests of the thermal conductivity of various mixtures of concrete. Copies are available at 20 cents each. An abstract of this bulletin appears in the December (1921) issue of Concrete, page 221.

Comparative tests of the heat insulating properties of various materials used in fire-resistive construction, conducted by the U. S. Bureau of Standards, were reported by W. A. Hull in Bureau of Standards *Technologic Paper* No. 130, 1919.

Numerous tests on floors of various materials and types of construction have been made at the fire-testing laboratory of Columbia University, New York, mainly on behalf of the New York bureau of building inspection.

Coefficients of heat conductivity for various materials, including concrete, are given in tables beginning on page 889 of Hodgman & Lange's "Handbook of Chemistry and Physics," fourteenth edition, 1930.

A pamphlet entitled "Wall Insulation," published by *Bulletin No.* 1 of the College of Engineering, University of Saskatchewan, Saskatoon, Saskatchewan, reports a number of tests made by A. R. Greig at the request of the provincial government.

The foregoing are only a few of the various sources of information on the subject of heat conductivity of concrete and other building materials.

Cement Paints With "Body"

Can you tell me if there is a cement paint on the market that has sufficient "body" to cover up walls of monolithic concrete or concrete wall block? My idea is to use it in a manner similar to stucco, but spraying it into place.—L. C. M., Ames, Iowa.

On page 30 of the January (1932) issue of Concrete you will find at least a partial answer to your inquiry, in an article headed "Paint Types and Specifications for Painting Concrete."

It is probable that you will find cement and oil paints most satisfactory for your purpose. Such paints are made by grinding portland cement and other pigments in an oil vehicle, thereby obtaining the necessary "body." This type of paint adheres well to concrete, as well as to galvanized iron and wood.

A number of manufacturers, a list of which will be sent you, produce paints of this character. Another list includes a few manufacturers of equipment for spraying cement paint on concrete.

Circular No. 327, issued by the American Paint and Varnish Manufacturers' Association, contains specifications for the application of concrete paints.

Insurance Rates on Concrete Buildings

A question came up in a recent discussion regarding fire and storm insurance rates on a building having a structural frame of fireproofed steel, and a similar building having a structural frame of reinforced concrete.

One architect asserted that a different rate is applied in the two cases.

Can you give me any information on this point? Aside from the structural frame, similar conditions are assumed for the two buildings.—S. D. F., Jacksonville, Fla.

There is no difference, either in rates on fire insurance or rates on storm insurance, in the two buildings.

The insurance rate-making organization having jurisdiction in Florida (and in other southeastern states) is the South-Eastern Underwriters Association, of Atlanta, Ga.

New Books and Pamphlets

Construction Management

Economics of Construction Management, by J. L. Harrison, Division of Management, U. S. Bureau of Public Roads. First edition, 336 pages, 5½ by 8 in., cloth binding. Gillette Publishing Company, Chicago, Ill., publisher. Price $3.75.

Building a structure, road, or plant of any kind is an operation requiring the co-ordination of machinery, materials, and manpower. To build economically and to co-ordinate efficiently is the function of the contractor. Because of the variable natures of the original materials and equipment co-ordination or management has become an involved procedure. To manage economically requires knowledge, skill, aptitude, and experience. Mr. Harrison's book clearly indicates the fundamentals in management, and he tells the contractor how to bid with the view of making a profit.

Settle Swamp Fills with Explosives

Accelerating Swamp Fill Settlement with Explosives is the title of an 84-page illustrated publication issued by the Hercules Powder Company, Inc., Wilmington, Del.

Methods for hastening the settlement of highway fills over swampy or marshy ground have long been sought by highway engineers, practically all of whom are confronted by this problem. Acceleration of settlement by blasting is one of the recent developments in this field. In this book the highway engineer will find a well illustrated summary of various successful methods employed, together with information and data that will be of use as a guide in field practice.

Winter Work in Concrete

Winterarbeiten im Beton und Eisenbetonbau (Winter Work in Concrete and Reinforced Concrete Construction). By Dr. A. Kleinlogel. Published by Wilhelm Ernst & Sohn, Berlin, Germany. Stiff paper cover, 122 pages, 6¾ by 9½ in. Numerous detail drawings, halftones, diagrams and tables. Price 9.80 gold marks.

All details involved in the construction of concrete work in cold weather are treated in this book. Approved methods of protecting and heating materials, protecting the newly placed concrete from frost, and various types of heating facilities, are among the many subjects covered.

This new book may well be considered as an authority in the development of standard practice in winter concreting, for all who can master the German language.

1932 Proceedings of A. S. T. M.

Proceedings of the American Society for Testing Materials, Thirty-fifth Annual Meeting, 1932. Published in two Parts by the Society at 1315 Spruce St., Philadelphia.

Part I includes the annual reports of the various committees of the Society, and the technical papers and standards appended to the reports. Part II contains the many technical papers presented at the annual meeting of 1932, and the written and verbal discussions of those papers.

The prices for each volume are $5.50 for paper binding; $6.00 for cloth binding; and $7.00 for half leather.

ORGANIZATIONS

American Association of State Highway Officials; W. C. Markham, Executive Secretary, 1222-24 National Press Building, Washington, D. C.

American Concrete Institute; Harvey Whipple, Secretary, 641 New Center Building, Detroit, Mich. Twenty-ninth annual convention, Feb. 21-24, Palmer House, Chicago, Ill.

American Concrete Pipe Association; M. W. Loving, Secretary, 33 West Grand Ave., Chicago. Twenty-sixth annual meeting, Feb. 27-28. Royal York Hotel, Toronto, Canada.

American Road Builders' Association; Chas. Upham, Engineer-Director, National Press Building, Washington, D. C.

American Society of Civil Engineers; Geo. T. Seabury, Secretary, 33 West Thirty-ninth St., New York City.

American Society for Testing Materials; C. L. Warwick, Secretary-Treasurer, 1315 Spruce St., Philadelphia, Pa. Annual meeting, June 26-30, Stevens Hotel, Chicago, Ill.

Associated General Contractors of America; E. J. Harding, Managing Director, 222 Munsey Bldg., Washington, D. C.

Building Officials Conference of America; Col. John W. Oehmann, Secretary, 1253 Lawrence St., N. E., Washington, D. C.

Cast Stone Institute; L. A. Falco, Secretary, Chapel St. and Blatchley Ave., New Haven, Conn.

Cement Institute; Luther G. McConnell, General Manager, 11 East 44th St., New York City.

Concrete Masonry Association; Jack Franklin, Secretary, 7071 Plankinton Bldg., Milwaukee, Wis. Third annual convention, Feb. 23. Palmer House, Chicago, Ill.

Concrete Reinforcing Steel Institute; R. W. Johnson, Secretary, 333 North Michigan Ave., Chicago, Ill.

Engineering Institute of Canada; 2050 Mansfield St., Montreal, Quebec.

Highway Research Board; Roy W. Crum, Director, 2101 Constitution Ave., Washington, D. C.

Joint Committee on Standard Specifications for Concrete and Reinforced Concrete; F. R. McMillan, Secretary, 33 West Grand Ave., Chicago.

National Board of Fire Underwriters; W. E. Mallalieu, General Manager, 85 John St., New York City.

National Concrete Burial Vault Association; J. H. Stuart, Secretary-Treasurer, Bremen, Ohio.

National Crushed Stone Association; J. R. Boyd, Secretary, 1735 14th Street, N. W., Washington, D. C.

National Engineering Inspection Association; B. H. Witherspoon, Secretary, P. O. Box 1115, Pittsburgh, Pa.

National Fire Protection Association; Franklin H. Wentworth, Secretary, 40 Central St., Boston, Mass.

National Lime Association; Norman G. Hough, Secretary and Manager, 927 Fifteenth St., N. W., Washington, D. C.

National Ready-Mixed Concrete Association; V. P. Ahearn, Secretary, 545 Munsey Bldg., Washington, D. C.

National Sand and Gravel Association; V. P. Ahearn, Executive Secretary, 545 Munsey Bldg., Washington, D. C.

National Slag Association; H. J. Love, Secretary-Treasurer, 1449 Leader Bldg., Cleveland, Ohio.

National Terrazzo and Mosaic Association; U. F. Durner, Secretary, 815 West St. Paul Ave., Milwaukee, Wis.

Northwest Concrete Products Association; W. P. Hews, Secretary-Treasurer, Yakima, Wash.

Portland Cement Association; Edward J. Mehren, President; William M. Kinney, General Manager, 33 West Grand Ave., Chicago.

Rail Steel Bar Association; H. P. Bigler, Engineering Secretary; Builders' Bldg., 228 N. La Salle St., Chicago, Ill.

Wire Reinforcement Institute; R. D. Bradbury, Director, National Press Bldg., Washington, D. C.

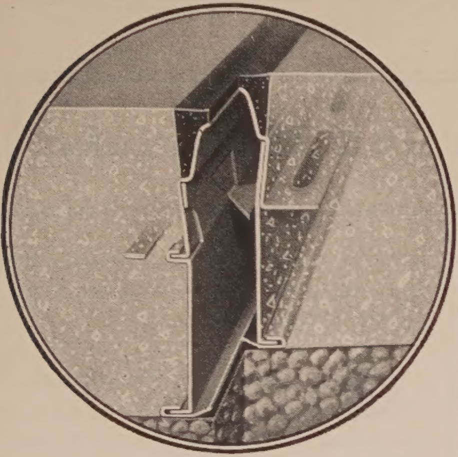
Wisconsin Concrete Products Association; Jack Franklin, Secretary-Treasurer, 425 East Water St., Milwaukee, Wis.

New Equipment and Materials

Features and Construction of Ace Joint

Practically indestructible, the Ace joint is said to insure not only lifetime serviceability but slab protection that reduces highway maintenance to a minimum. It is the product of the American Concrete Expansion Joint Co., Chicago, Ill.

The joint consists of metal sides forming an air chamber that allows free slab movements caused by expansion and contraction. This air chamber is closed at the top by an all-copper top cap, which, because of its inverted U-type construction, is claimed to be immune against jamming and ultimate collapse.



The side walls of the metallic air chambers are punched at intervals for the insertion of dowel bars.

Pumpcrete System Tried Out on Construction Work

Standard mixtures of concrete as usually employed in structural concrete work are pumped at the rate of 15 to 20 cu. yd. per hour, with new pumping equipment manufactured under the trade name of Pumpcrete by the Chain Belt Co. of Milwaukee.

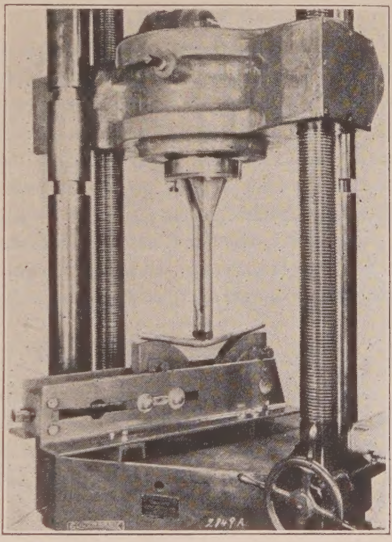
It is said that this system will transport concrete 500 ft. horizontally, or up to 72 ft. vertically. The pump unit is of the piston type and may be driven by either a gasoline engine or an electric motor.

This new method of delivering concrete has been successfully tried out, the manufacturer states, on a number of construction jobs, one of which is shown in the illustration.

The system was on display at the recent Road Show exhibit in Detroit.

Cold Bend Testing Device Characteristics

Baldwin-Southwark Corp., Philadelphia, announces the addition to its line of materials testing equipment of the recently developed cold bend testing device.



The new device, the firm states, is adaptable to any type of testing machine having facilities for compression testing.

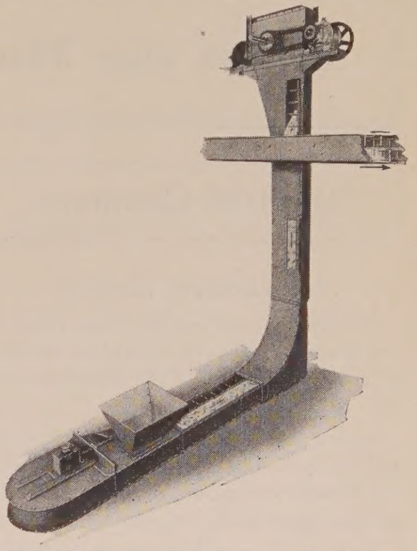
Load is applied by a column consisting of two 1¼-in. diameter steel rods welded to a base plate which is fitted with clamps for attachment to the spherical head of the testing device. The other ends of the rods are welded together with a fillet ¼-in. wide and the ends milled with V-shaped groove to hold the hardened steel pins around which the bar is to be bent.

To bend a bar through 180 deg. requires a movement of 6-in. plus diameter of the bar plus the radius of the pin. Bending will always start with a span of 12-in. plus the diameter of the pin plus twice the thickness of the bar.

Bulk Conveyor Combines Vertical, Horizontal

Carrying bulk materials horizontally, vertically, up inclines and around curves, the new Redler conveyor consists of a series of light, skeleton flights, closely spaced upon a flexible steel cable or conveyor chain pulled through a smooth trough of steel or wood. Material may be fed into the trough and discharged at any point, according to the Stephens-Adamson Mfg. Co., Aurora, Ill.

The entire trough full of material flows with the flights in a solid tranquil column that follows the conveyor trough wherever it leads. Both material and conveyor flights travel at the same speed without slippage or disturbance.



The "U" and "H" are two types of this conveyor said to be in common use. A third, known as the "measuring" conveyor, is sometimes used for feeding one or more different materials in measured volumes.

High Early Strength White Cement New Product

A white special portland cement is announced by the International Non-Staining Cement Co., Inc., Brooklyn, N. Y.

Lafarge Super White portland cement is a double-burnt product of extreme fineness, retaining only 2 to 3 per cent on a 200-mesh screen. It is slow setting, quick hardening, and attains high early tensile, compressive and bonding strengths.

Other physical properties include its non-staining, non-efflorescent, and color-uniformity qualities.

Cast stone manufacture, stucco finish coat, terrazzo floors, swimming pools, concrete block, traffic markings, and ornamental concrete products are some of the uses to which it may be put.

Test samples are available upon request.

Instrument for Reinforcing Examination

The X-ray Crystallograph is designed for the examination of the effects of heat and mechanical treatment on metals and yields information on grain size, crystal orientation, presence of strain, etc., according to Adam Hilger, Ltd., London, England.

The instrument is simple in operation and direct in the information it gives on the points desired, it is added.

The diffraction patterns being obtained directly from the surface of the material, there is no necessity for cutting thin sections and possibly distorting the existing structure of the material.

Branford Vibrators Increase Frequency

Announcement is made by the Malleable Iron Fittings Co., Branford, Conn., that all of the small hand vibrators produced by this company have been vastly improved with respect to their frequency of vibration. The actual increase in frequency is said to be 75 per cent in all sizes.

These vibrators are designed for various uses, including the placement of monolithic concrete, the casting of concrete pipe, architectural cast stone, large and small precast concrete units and related products.

General Motors Truck Making New 6-Cyl. Engine

The introduction of a new 6-cyl., valve-in-head engine, designed for use in super-powered, high speed delivery models, and with advanced features making for the maximum of power, economy, durability and dependability, is announced by the General Motors Truck Co.

The new engine is known as the "221" and is now available in G. M. C. models T-18, one and a half to two tons capacity, and T-23, two to three tons capacity. The engine is fundamentally designed to give more power with greater economy. It provides more sustained torque per cubic inch of piston displacement than any other light duty truck engine built, it is said.

About the Makers of Equipment and Materials

Industrial Literature

Extensometer Booklet

The Oxweld extensometer, type TM-3, is described in a 7-page illustrated booklet published by the *Linde Air Products Co.*, New York City.

Another development of Union Carbide and Carbon Research Laboratories, Inc., the Oxweld extensometer, Type TM-3, is also described in this booklet.

This booklet describes the extensometer in detail, what it is, how it works, how to use it to determine the yield point, and how to use it as a strain gauge to show elongation of a specimen under specified loads.

Sprout, Waldron Equipment

Bulk cement handling equipment manufactured by *Sprout, Waldron & Co., Inc.*, Muncy, Pa., is cataloged in *Bulletin* 632.

Units included are the vertical screw elevator, Turn-o-matic cement batch checker, cement weighing batcher, Clark type power shovel, storage bins, and elevators.

Conveyor Belt Insert

A 4-page insert for its mechanical goods catalog on its *Maxecon* general service conveyor belt and improved hot material belt has just been published by the *B. F. Goodrich Rubber Co.*, Akron, Ohio, and is now available on request to the manufacturer. The insert discusses construction and typical applications of the two types of belting.

Laboratory Matters

The current issue of *The Laboratory* for December, published by the *Fisher Scientific Co.*, Pittsburgh, "for those interested in keeping informed on the latest developments of laboratory apparatus and technique," contains general articles as well as three of specific interest.

The latter concerns a new laboratory timer, an evaporation accelerator, and a new means of recording humidity.

Placing Floor Finish

The *Kelley* method of laying low water-cement ratio concrete floor finish is described and profusely illustrated in an 8-page leaflet prepared by the *Kelley Electric Machine Co.*, Buffalo, N. Y.

Increase in durability, overcoming of dusting, coarse aggregate in surface and cost reduction are features stressed.

Manufacturers' News

Equipment Representatives

The firm of Ginsberg, Barnes & Conway, Inc., has been organized for the sales of construction and engineering equipment in New York City and adjacent territory. The address is 855 Walton Avenue. Butler Bin, Chain Belt, Smith Engineering and Byers machine equipment is represented exclusively.

Frank Ginsberg, Don Barnes, Jack Conway and *Bob Campello* comprise the company. L. H. Burt and R. D. Weaver are the Long Island and New Jersey representatives respectively.

Autocar Executive Personnel

Charles E. Doling, a vice-president of the *Autocar Sales and Service Co.*, Autocar company subsidiary, has been transferred from the managership of the Philadelphia branch to the metropolitan New York area, where he has taken charge of sales contacts.

Edward F. Coogan, also a vice-president of the subsidiary company, is being transferred from the managership of the Boston district in order to take Mr. Doling's place in Philadelphia.

H. R. Gary, who for the past two years has supervised various Autocar branch operations and discharged other executive duties as assistant to the president with headquarters in Ardmore, has been elected a vice-president of the Autocar Sales and Service Co. and transferred to the Boston branch managership, succeeding Mr. Coogan.

American Licenses Williamsport

Williamsport Wire Rope Co. recently has been licensed to manufacture preformed wire rope under the *American Cable Co.'s* patents.

Other American concerns who are licensed to make preformed wire rope are: American Steel & Wire Co., Broderick & Bascomb Rope Co., E. H. Edwards Co., General Cable Corporation, Hazard Wire Rope Co., MacWhyte Co., Pacific Wire Rope Co., Wickwire Spencer Steel Co., Wire Rope Manufacturing & Equipment Co.